NORTHCENTRAL UNIVERSITY
ASSIGNMENT COVER SHEET

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THIS FORM MUST BE COMPLETELY FILLED IN

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EDU7006-8 **Dr. Rebecca Watts**

Quantitative Research Design **Activity #7a: Explore Samples, Power Analysis, and Design Sensitivity**

Comments:

Faculty Use Only

~~<Faculty comments here>~~Michael, thanks for submitting this assignment. You did very well in explaining the different sampling methods. I am attaching a file that will help you with part b of this assignment. I want you to use this file to help you. Change the numbers up when you run the analyses so that you don't have the same results. This file will help you understand the G*Power analyses. Let me know if you have questions.

Activity 7.docx

<Faculty Name> <Grade Earned> <Writing Score> <Date Graded>

Explore Samples, Power Analysis, and Design Sensitivity

1. Compare and contrast internal and external validity. Describe and give examples of research questions for which external validity is a primary concern. Describe and give examples of research questions in which internal validity is a primary concern. Discuss strategies researchers use in order to make strong claims about the applicability of their findings to a target population.

External validity addresses concerns about how far the results of a study can be generalized across other populations (Jackson, 2012; Trochim & Donnelly, 2008). External validity is primarily concerned with what populations, settings, treatment variables and measurement variables can the particular effect be generalized across larger populations (Jackson, 2012). The main objective for researchers considering external validity is designing a study, which ensures results obtained from a small experiment group can be extended to make predictions about the entire population (Shuttleworth, August 2009). If a research program has poor external validity, the results will not be taken seriously. Internal validity refers to the ability of a research design to provide a valid test of a hypothesis, which includes ruling out all plausible explanations for the results (Shuttleworth, July 2009). According to Trochim (2006) internal validity is only relevant when studies are designed to establish a casual relationship and becomes irrelevant when conducting qualitative studies.

It is first essential that the research design have internal validity (Trochim & Donnelly, 2008). When internal validity has been established, external validity becomes a researcher's

next priority, which may lead to similar studies being researched to determine how far the study results can be generalized. It is important to note that studies with high internal validity often have low external validity (Ricker, n.d.). Additionally, once researchers have a representative sample, high internal validity involves randomly assigning subjects to groups, rather than using pre-determined selection factors (Shuttleworth, August 2009). In order to adequately control for the effects of external variables it is necessary to create an experiment that includes two key factors: the experiment group should be a close representative sample of the population to which the researcher wants to generalize and the research should be similar in regards to the physical environment and setting (Ricker, n.d.). To increase external validity it is important to ensure that the representative population is as close to the general population the study represents. External validity answers what other settings, populations, treatment variables, and measurement variables can the same results be found? Furthermore, external validity is how and where the study can be applied (Osborn, n.d.). Very good explanation here Michael.

2. Compare and contrast random selection and random assignment. Be sure to include a discussion of when you would want to do one or the other and the possible consequences of failing to do random selection or random assignment in particular situations.

Random selection refers to how participants of the experiment group are selected from the population for inclusion in the study (Trochim, 2006). Random assignment is a characteristic of an experimental design in which study participants are assigned to the experiment or control group using a random procedure (Trochim, 2006). According to Trochim (2006) "it is possible to have both random selection and assignment" (para. 3) in a research experiment design. Additionally, it is possible to have only one, or none, included in the study (Statistics Solutions, 2014; Trochim, 2006).

Random selection requires a random sampling, in which the population is sorted into groups, from which the treatment group is chosen. Random sampling relies on a random probability that the selection of the sample is truly random and can be used to make inferences across a general population in which the study applies (Statistic Solutions, 2014). Bias can exist in random selection due to a flaw in the sample selection process (Trochim & Donnelly, 2008). This happens when part of the data is excluded due to a particular attribute (Jackson, 2012; Trochim & Donnelly, 2008). The exclusion of this data or information can influence the statistical significance of the experiment, or produce distorted results. Random assignment occurs following the random selection of participants. In a valid and true study, participants are randomly assigned to either the treatment or control group (Trochim, 2006). Sometimes, random assignments are dismissed due to particular ethical or practical concerns and in some cases participants choose not to cooperate or drop out of the study (Berk, Smyth, & Sherman, 1988). Additionally, the constructs of random assignment can either be misunderstood or disregarded causing random assignments to be biased (Berk, Smyth, & Sherman, 1988). Berk, Smyth, and Sherman (1988) identified five strategies to minimize biases that can result from faulty random assignment, which included:

1. Facilitators of the study understand the experiment process and design.
2. Facilitators are given extensive training.
3. Frequent meetings are held with study facilitators to reinforce the experiment constructs.
4. Facilitators are monitored frequently to ensure experiment constructs are implemented with fidelity.
5. The constructs used to randomly assign participants should be constructed to make it difficult for error to occur.

3. Explain the relationship between sample size and the likelihood of a statistically significant difference between measured values of two groups. In other words, explain why, all else being equal, as sample size increases the likelihood of finding a statistically significant relationship increases.

Random sampling can help researchers overcome a concern that the sample group is representative of the population the study is meant to generalize (Jackson, 2012). The research results of a small sample, applied to a whole population, should consist of a sample size that is at least a size that could meet the significance level (Kalla, 2009). Anticipated research results can often be figured by reviewing other studies, common sense, or by comparing similar experiments (Kalla, 2009). Additionally, when researchers compare the anticipated statistical significance with the sample size, the results of the experiment can be applied to the whole population. This comparison can be validated using a significance test called the power of g (Jackson, 2012). Significance levels indicate how likely research results are due to chance. The confidence interval and confidence level of the research results determines the size of the sample (Kalla, 2009; Trochim & Donnelly, 2008). According to Kalla (2009) it is beneficial to the researcher to compare significance levels with the sample size before running the experiment in order to determine needed adjustments to the study. Researchers increase the likelihood of finding a statistical significant relationship between variables when there is a large sample size because a larger sample size means the results can be generalized across a larger population with a higher confidence level. A higher sample size and confidence level decreases the likelihood of encountering ~~Type-I and~~ Type-II errors (Kalla, 2009) but increases the likelihood of making a type I error because you are more likely to reject the null hypothesis when the sample size is larger. This is because the ratio used to determine t has a smaller denominator due to the smaller standard error of the mean. Similarly, in the ANOVA, the within subjects sum of squares is usually

smaller in a larger sample and therefore the MS (error) is smaller and thus the ratio of MS (between) to MS (within) or the F-value will be larger.

4. Compare and contrast probability and non-probability sampling. What are the advantages and disadvantages of each?

Researchers collect study results using a wide variety of methods, and many of these methods involve systematically selecting participants of the study. A random selection of the experiment group can be made using probability-based methods (Trochim & Donnelly, 2008). Probability sampling typically is a procedure involving lists of random numbers or procedures that ensure different groups individuals in the population have equal probabilities of being selected for the sample (Jackson, 2012; Trochim & Donnelly, 2008). In probability-based sampling, the first step is to decide on the population sample. There are different probability sampling methods, which include:

- simple random sampling where drawing a sample from a population ensures that every possible sample member of the sample has an equal probability of being chosen for the sample;
- stratified random sampling dividing the population into homogeneous subgroups and then taking a simple random sampling;
- systematic random sampling determines at random where in the population to begin sampling then following the sampling frame by selecting every nth individual.;
- cluster random sampling involves dividing the population into groups called clusters, randomly selecting clusters and then sampling each one;
- and multi-stage sampling where several sampling techniques are incorporated into the research study design (Trochim & Donnelly, 2008).

Alternatively, the selection of the experiment group may be made by other methods, imploring some element of judgment. Methods involving judgment are sometimes referred to as non-probability selection (Trochim & Donnelly, 2008). According to Trochim and Donnelly (2008) "the difference between nonprobability and probability sampling is that nonprobability sampling does not involve random selection…" (p. 48). Additionally, nonprobability sampling can be generalized across a larger population but cannot depend on the rationale of probability theory (Trochim & Donnelly, 2008). Nonprobability sampling is best used when members of the population do not have an equal chance of being selected as part of the study sample (Jackson, 2012). In nonprobability sampling there are a variety of sampling methods, which include:

- convenience sampling, one of the most common methods, which samples a population based on convenience and has no evidence that the sample is representative of the larger population;
- and purporsive sampling, which involves taking a sample with a purpose in mind using several different sampling methods such as expert sampling, quota sampling, and snowball sampling (Trochim & Donnelly, 2008).

Good discussion on the different sampling strategies.

References

Berk, R. A., Smyth, G. K., & Sherman, L. W. (1988). When random assignment fails: Some lessons from the Minneapolis spouse abuse experiment. *Journal of Quantitative Criminology*, *4*(3), pp. 209-223.

Jackson, S. L. (2012). *Research methods and statistics: A critical thinking approach*. Belmont, CA: Wadsworth Cengage Learning.

Kalla, S. (Jun 18, 2009). Statistical Significance And Sample Size. Retrieved from Explorable.com: https://explorable.com/statistical-significance-sample-size

Osborn, D. (n.d.). External validity. [web-page]. Retrieved from http://cas.bellarmine.edu/Osborn/hypertut_piv/external_validity_is_concerned_w.htm

Ricker, J. (n.d.). 6-7: Research validity – Internal & External. [web-page]. Retrieved from http://sccpsy101.com/home/chapter-6/section-7/

Shuttleworth, M. (Jul 5, 2009). Internal Validity. Retrieved Oct 15, 2014 from Explorable.com: https://explorable.com/internal-validity

Shuttleworth, M. (Aug 7, 2009). External Validity. Retrieved Oct 15, 2014 from Explorable.com: https://explorable.com/external-validity

Statistics Solutions. (2014). Difference between random selection and random assignment. [web-page]. Retrieved from http://www.statisticssolutions.com/difference-between-random-selection-and-random-assignment/

Trochim, William M. (October 20, 2006). The research methods knowledge base, 2nd edition. Retrieved from http://www.socialresearchmethods.net/kb/expequi.php

Trochim, W. M., & Donnelly, J. P. (2008). *Research methods knowledge base*. Mason, OH: Atomic Dog